1-1-1966

Test 939: John Deere 4020 Syncro-Range Gas

NEBRASKA TRACTOR TEST 939 – JOHN DEERE 4020 SYNCRO-RANGE GASOLINE

POWER TAKE-OFF PERFORMANCE

Hp	Crank-shaft speed rpm	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Temperature Degrees F Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
95.59	2200	7.887	0.503	12.12	170	58	75	28.973
Standard Power Take-off Speed (1000 rpm)—One Hour								
85.81	1895	6.856	0.487	12.52	172	58	75	28.985
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
84.75	2296	7.266	0.523	11.66	169	59	76	.....
0.00	2462	2.873	.....	.....	160	57	75	.....
44.00	2381	4.989	0.691	8.82	167	58	75	.....
95.92	2200	7.906	0.503	12.13	174	59	77	.....
22.28	2418	3.950	1.081	5.64	165	59	77	.....
64.89	2343	6.292	0.591	10.31	169	59	78	.....
Av 51.97	**2350**	**5.546**	**0.651**	**9.37**	**167**	**58**	**76**	**28.967**

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Temp Degrees F Cool-ing med	Air wet bulb	Air dry bulb	Barom-eter inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear											
83.28	6354	4.91	2201	6.73	7.705	0.564	10.81	172	57	75	28.800
75% of Pull at Maximum Power—Ten Hours—4th Gear											
68.28	4822	5.31	2333	4.98	6.834	0.610	9.99	168	55	57	28.799
50% of Pull at Maximum Power—Two Hours—4th Gear											
46.30	3173	5.47	2355	3.04	5.551	0.731	8.34	164	55	57	28.840
MAXIMUM POWER WITH BALLAST											
77.84	10658	2.74	2269	14.52	2nd Gear			174	57	75	28.780
81.66	8243	3.71	2201	9.50	3rd Gear			170	56	73	28.870
84.10	6420	4.91	2201	6.80	4th Gear			168	55	72	28.880
84.23	5062	6.24	2199	4.81	5th Gear			171	60	67	28.830
84.18	3806	8.29	2200	3.48	6th Gear			170	60	70	28.830
81.51	2827	10.81	2198	2.66	7th Gear			170	62	70	28.820
MAXIMUM POWER WITHOUT BALLAST											
77.32	6272	4.62	2247	14.85	4th Gear			172	67	71	29.020

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear

Pounds pull	6420	6653	6740	6742	6792	6713	6538
Horsepower	84.10	77.96	69.85	61.25	52.52	43.31	33.78
Crankshaft speed, rpm	2201	1975	1749	1534	1308	1090	871
Miles per hour	4.91	4.39	3.89	3.41	2.90	2.42	1.94
Slip of drivers, %	6.80	7.21	7.35	7.35	7.62	7.49	7.21

TIRES, BALLAST and WEIGHT		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 18.4-34; 8; 20	Two 18.4-34; 8; 16
Ballast	—Liquid	1010 lb each	None
	Cast iron	1400 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-15; 6; 36	Two 7.50-15; 6; 28
Ballast	—Liquid	None	None
	Cast iron	150 lb each	None
Height of drawbar		19 inches	20½ inches
Static weight with operator—Rear		11290 lb	6470 lb
Front		2740 lb	2440 lb
Total		14030 lb	8910 lb

Department of Agricultural Engineering

Dates of Test: MAY 17 to MAY 24, 1966

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

FUEL, OIL and TIME Fuel regular gasoline **Octane No** Motor 84.5 Research 92.6 (rating taken from oil company's typical inspection data) **Specific gravity converted to 60°/60°** 0.7325 **Weight per gallon** 6.098 lb **Oil** SAE 20-20W **API service classification** MS, DG **To motor** 1.744 gal **Drained from motor** 1.531 gal **Transmission and final-drive lubricant** John Deere Special 303 oil **Total time engine was operated** 42 hours.

ENGINE Make John Deere gasoline **Type** 6 cylinder vertical **Serial No** 21E136714 **Crankshaft mounted** lengthwise **Rated rpm** 2200 **Bore and stroke** 4¼" x 4" **Compression ratio** 7.5 to 1 **Displacement** 340 cu in **Carburetor size** 1¾" **Ignition system** battery **Cranking system** 12 volt electric **Lubrication** pressure **Air cleaner** dry type with replaceable paper element **Oil filter** full flow replaceable paper element **Oil cooler** radiator for transmission and hydraulic oil **Fuel filter** screens in carburetor and fuel pump **Muffler** was used **Cooling medium temperature control** two thermostats.

CHASSIS Type standard **Serial No** SNT211-R135208R **Tread width** rear 60" to 91" front 50.75" to 79.88" **Wheel base** 100.25" **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 26.0" Vertical distance above roadway 38.0" Horizontal distance from center of rear wheel tread 0" to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with partial range syncro-mesh **Advertised speeds mph** first 1.9 second 3.0 third 4.0 fourth 5.1 fifth 6.3 sixth 8.3 seventh 10.8 eighth 17.6 reverse 3.9 and 6.2 **Clutch** single plate dry disc operated by foot pedal **Brakes** wet disc hydraulically power actuated operated by two foot pedals which can be locked together **Steering** hydraulic with power assist **Turning radius** (on concrete surface with brake applied) right 128" left 128" (on concrete surface without brake) right 150" left 150" **Turning space diameter** (on concrete surface with brake applied) right 283" left 283" (on concrete surface without brake) right 335" left 335" **Belt pulley** 966 rpm at 1900 engine rpm diam 12" face 8.5" **Belt speed** 3034 fpm **Power take-off** 1003 rpm at 1900 engine rpm.

REPAIRS and ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

First gear was not run as it was necessary to limit the pull in second gear to avoid excessive wheel slippage. Eighth gear was not run because it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 939.

L. F. LARSEN
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
J. J. SULEK
D. E. LANE
Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station
E. F. Frolik, Dean; H. H. Kramer, Director, Lincoln, Nebraska

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, ½ of the 85% torque; maximum power, ¼ and ¾ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effect of speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Power Without Ballast. All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the **Nebraska Tractor Tests** write to the **Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.**

John Deere 4020 Syncro-Range Gasoline